

To: James Cashwell
From: Chris Ricardi
Date: January 18, 2013
Subject: Interim Response Steps Work Plan Slurry Wall Monitoring Program 4Q12 –
November 2012

**DATA VALIDATION REPORT
NOVEMBER 2012 SLURRY WALL GROUNDWATER, SURFACE WATER AND SEDIMENT
SAMPLES
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS**

TestAmerica Laboratories Data Sets: 480-28600, 480-28687, 480-28728, and 480-28730

1.0 INTRODUCTION

Groundwater, surface water, and sediment samples were collected from the Olin Chemical Superfund Site from November 13 to November 16, 2012. Samples were analyzed by TestAmerica Laboratories in Buffalo, New York. Data were reported in sample delivery groups (SDGs) 480-28600-1, 480-28687-1, 480-28728-1, and 480-28730-1. A summary of samples included in this review is contained in Table 1. Samples reviewed in this report were analyzed for the following USEPA SW-846 (USEPA, 1996), USEPA wastewater (USEPA, 1993), or Standard Methods (APHA, 1995):

- Dissolved metals (aluminum and chromium) by USEPA Method 6010B in groundwater
- Dissolved and total metals (aluminum, chromium, and sodium) by USEPA Method 6010B in surface water
- Total metals (aluminum, chromium, and iron) By USEPA Method 6010B in sediment
- General chemistry analyses for ammonia by USEPA Method 350.1 (Lachat 10-107-06-1B), chloride and sulfate by USEPA Method 300, nitrate and nitrite by USEPA Method 353.2, and specific conductance by SM 2510B.

The Final Interim Response Steps Work Plan (MACTEC, 2007) and the MassDEP Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP) [MassDEP, 2010] were used as references during the review. Analytical packages were reviewed using the Level 1 Data Quality Evaluation checklists that were developed for the Olin Wilmington monitoring tasks. Final sample results are presented on data summaries in Table 2. A summary of validation qualification actions is presented on Table 3 for results that were qualified. Validation reason codes are associated with final results that have been qualified as indicated in Table 3.

2.0 METALS

Data were reviewed for the following parameters:

- * Data Completeness
- * Holding Time
- * Blanks
- * Laboratory Control Sample / Laboratory Control Sample Duplicate Analysis (LCS/LCSD)
- * Matrix Spike/Matrix Spike Duplicate Analysis (MS/MSD)
- * Detection Limits
- * Dissolved vs. Total Metals Comparison (surface water only)
- * indicates that criteria were met for this parameter

MS/MSD

SDG 480-28730-1

Sample OC-SD-SD5 was submitted for MS/MSD analysis. Percent recovery for aluminum (148) in the MS was above the QC limit of 125. The percent recovery for aluminum (-36) in the MSD was below the QC limit of 75. The relative percent difference (RPD) limit of 30 was exceeded for aluminum (44). Sample results for aluminum in SDG 480-28730-1 were qualified estimated (J).

3.0 GENERAL CHEMISTRY – Ammonia, Chloride, Sulfate, Nitrate, Nitrite, and Specific Conductance

Data were reviewed for the following parameters:

- * Data Completeness
- * Holding Time
- * Blanks
- * Matrix Spike Analysis
- * Laboratory Duplicate Analysis (specific conductance only)
- * Laboratory Control Sample/Laboratory Control Sample Duplicate Analysis
- * Detection Limits
- * indicates that criteria were met for this parameter

Holding Time

SDG 480-28728-1

The nitrate/nitrite technical holding time of 48 hours was grossly exceeded (5 days) in all samples. The sample results for nitrite were reported as not detected and were rejected (R) due to nitrite being converted to nitrate over time resulting in possible erroneous results of not detected in the samples. Nitrate results were qualified estimated (J) due to the possible high bias resulting from the conversion of nitrite to nitrate.

Detection Limits

SDG 480-28728-1

Nitrite quantitation limits were reported at 0.05 mg/L, above the project goal of 0.01 mg/L.

Unless discussed above, sample results are interpreted to be usable as reported by TestAmerica.



Chris Ricardi, NRCC-EAC
Senior Chemist

4/18/2013

Date



Michael Murphy
Project Principal

4/18/2013

Date

References:

American Public Health Association (APHA), 1995. "Standard Methods for Examination of Water and Wastewater"; 19th Edition; APHA, 1015 Fifteenth St., NW. Washington, DC 20005.

MACTEC, 2007. "Final Interim Response Steps Work Plan"; Olin Chemical Superfund Site; 51 Eames Street, Wilmington, Massachusetts; August 8, 2007.

Massachusetts Department of Environmental Protection (MassDEP), 2010. "The Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP)"; Bureau of Waste Site Cleanup; 1 Winter Street, Boston, Massachusetts 02108; WSC-CAM; July 2010.

- U.S. Environmental Protection Agency (USEPA), 1993. "Methods for Chemical Analysis and Water and Wastes (MCAWW)", EPA/600/4-79-020 (March 1983) with updates and supplements EPA/600/4-91-010 (June 1991), EPA/600/R-92-129 (August 1992) and EPA/600/R-93-100 (August 1993).
- U.S. Environmental Protection Agency (USEPA), 1996. "Test Methods for Evaluating Solid Waste"; Laboratory Manual Physical/Chemical Methods; Office of Solid Waste and Emergency Response; Washington, DC; SW-846; November 1986; Revision 4 - December 1996.

Table 1
Sample Summary
Data Validation Report
November 2012 Slurry Wall / Cap Groundwater, Surface Water, and Sediment
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab Sample ID	Location	Sample ID	Sample Date	SW846 6010B Total Metals	SW846 6010B Filtered Metals	E350.1 (QuickChem 10-107-06-1-B) Ammonia	A2510B Conductance	40CFR136A 300.0 Anions	E353.2 Nitrate/Nitrite	E160.3 Percent Solid
<i>Groundwater</i>										
480-28600-1	GW-202S	OC-GW-202S	11/13/2012		2	1	1	2		
480-28600-2	GW-202D	OC-GW-202D	11/13/2012		2	1	1	2		
480-28600-3	GW-25	OC-GW-25	11/14/2012		2	1	1	2		
480-28600-4	GW-78S	OC-GW-78S	11/13/2012		2	1	1	2		
480-28600-5	GW-79S	OC-GW-79S	11/14/2012		2	1	1	2		
480-28600-6	PZ-16RR	OC-PZ-16RR	11/14/2012		2	1	1	2		
480-28600-7	PZ-17RR	OC-PZ-17RR	11/14/2012		2	1	1	2		
480-28600-8	PZ-18R	OC-PZ-18R	11/14/2012		2	1	1	2		
480-28600-9	GW-202D	OC-DUP-202D	11/13/2012		2	1	1	2		
480-28600-10	PZ-24	OC-PZ-24	11/13/2012		2	1	1	2		
480-28600-11	PZ-25	OC-PZ-25	11/13/2012		2	1	1	2		
480-28600-12	GW-10S	OC-GW-10S	11/14/2012		2	1	1	2		
480-28600-13	GW-76S	OC-GW-76S	11/14/2012		2	1	1	2		
480-28600-14	GW-24	OC-GW-24	11/14/2012		2	1	1	2		
480-28687-1	GW-201S	OC-GW-201S	11/15/2012		2	1	1	2		
480-28687-2	GW-34D	OC-GW-34D	11/15/2012		2	1	1	2		
480-28687-3	GW-34SR	OC-GW-34SR	11/15/2012		2	1	1	2		
480-28687-4	GW-35S	OC-GW-35S	11/15/2012		2	1	1	2		
480-28687-5	GW-43SR	OC-GW-43SR	11/15/2012		2	1	1	2		
480-28687-6	GW-CA1	OC-GW-CA1	11/15/2012		2	1	1	2		
<i>Surface Water</i>										
480-28728-1	ISCO1	OC-SW-ISCO1	11/16/2012	3	3	1	1	2	2	
480-28728-2	ISCO2	OC-SW-ISCO2	11/16/2012	3	3	1	1	2	2	
480-28728-3	ISCO3	OC-SW-ISCO3	11/16/2012	3	3	1	1	2	2	
480-28728-4	PZ-16RR	OC-SW-PZ-16RRSW	11/16/2012	3	3	1	1	2	2	
480-28728-5	PZ-17RR	OC-SW-PZ-17RRSW	11/16/2012	3	3	1	1	2	2	
480-28728-6	PZ-18R	OC-SW-PZ-18RSW	11/16/2012	3	3	1	1	2	2	
480-28728-7	SD-17	OC-SW-SD-17	11/16/2012	3	3	1	1	2	2	
480-28728-8	SD-17	OC-SW-SD-17-DUP	11/16/2012	3	3	1	1	2	2	
<i>Sediment</i>										
480-28730-1	SD-SD1	OC-SD-SD1	11/16/2012	3						2
480-28730-2	SD-SD2	OC-SD-SD2	11/16/2012	3						2
480-28730-3	SD-SD3	OC-SD-SD3	11/16/2012	3						2
480-28730-4	SD-SD4	OC-SD-SD4	11/16/2012	3						2
480-28730-5	SD-SD5	OC-SD-SD5	11/16/2012	3						2
480-28730-6	SD-SD5	OC-SD-SD5-DUP	11/16/2012	3						2

Notes:

Number listed under method indicates number of target analytes reported.

Prepared by / Date: KJC 12/07/12

Checked by / Date: MJW 12/12/12

Table 2
Final Results Summary
Data Validation Report
November 2012 Slurry Wall / Cap Groundwater, Surface Water and Sediment
Olin Chemical Superfund Site
Wilmington, Massachusetts

				Loc Name		GW-10S		GW-201S		GW-202D		GW-202D		GW-202S		GW-24		GW-25	
				Field Sample ID		OC-GW-10S		OC-GW-201S		OC-DUP-202D		OC-GW-202D		OC-GW-202S		OC-GW-24		OC-GW-25	
				Field Sample Date		11/14/12		11/15/12		11/13/12		11/13/12		11/13/12		11/14/12		11/14/12	
				QC Code		FS		FS		FD		FS		FS		FS		FS	
				Lab Sample Delivery Group		480-28600-1		480-28687-1		480-28600-1		480-28600-1		480-28600-1		480-28600-1		480-28600-1	
Frac	Method	Analyte	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
F	SW6010	Aluminum	mg/l	5.1		0.2 U		3.2		3.2		0.2 U		0.2 U		0.2 U		0.2 U	
F	SW6010	Chromium	mg/l	0.002 J		0.041		0.36		0.36		0.0037 J		0.005 U		0.0022 J			
N	E300	Chloride	mg/l	29		120		180		170		83		30		140			
N	E300	Sulfate	mg/l	87		1400		880		860		220		43		66			
N	E350.1	Nitrogen, as Ammonia	mg/l	1.5		140		120		140		40		26		35			
N	A2510B	LAB SPECIFIC CONDUCTANCE	umhos/cm	320		3800		2400		2400		950		400		770			

Notes:

N = normal

F = filtered

FS = field sample

FD = field duplicate

U = not detected, value is the detection limit

J = value is estimated

mg/l = milligram per liter

umhos/cm = micromhos per centimeter

Table 2
Final Results Summary
Data Validation Report
November 2012 Slurry Wall / Cap Groundwater, Surface Water and Sediment
Olin Chemical Superfund Site
Wilmington, Massachusetts

				Loc Name		GW-34D		GW-34SR		GW-35S		GW-43SR		GW-76S		GW-78S		GW-79S	
				Field Sample ID		OC-GW-34D		OC-GW-34SR		OC-GW-35S		OC-GW-43SR		OC-GW-76S		OC-GW-78S		OC-GW-79S	
				Field Sample Date		11/15/12		11/15/12		11/15/12		11/15/12		11/14/12		11/13/12		11/14/12	
				QC Code		FS		FS		FS		FS		FS		FS		FS	
				Lab Sample Delivery Group		480-28687-1		480-28687-1		480-28687-1		480-28687-1		480-28600-1		480-28600-1		480-28600-1	
Frac	Method	Analyte	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
F	SW6010	Aluminum	mg/l	0.2	U	0.2	U	0.2	U	0.081	J	0.2	U	0.2	U	0.2	U	0.2	U
F	SW6010	Chromium	mg/l	0.017		0.0017	J	0.029		0.005	U	0.0016	J	0.0035	J	0.014			
N	E300	Chloride	mg/l	12		1.6		4.6		150		49		28		180			
N	E300	Sulfate	mg/l	28		8.9		96		30		22		540		860			
N	E350.1	Nitrogen, as Ammonia	mg/l	12		0.012	J	14		1.2		9.4		49		120			
N	A2510B	LAB SPECIFIC CONDUCTANCE	umhos/cm	200		70		490		610		265		1500		2500			

Notes:

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J = value is estimated

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umhos/cm = micromhos per centimeter

Table 2
Final Results Summary
Data Validation Report
November 2012 Slurry Wall / Cap Groundwater, Surface Water and Sediment
Olin Chemical Superfund Site
Wilmington, Massachusetts

				Loc Name		GW-CA1		PZ-16RR		PZ-17RR		PZ-18R		PZ-24		PZ-25	
				Field Sample ID		OC-GW-CA1		OC-PZ-16RR		OC-PZ-17RR		OC-PZ-18R		OC-PZ-24		OC-PZ-25	
				Field Sample Date		11/15/12		11/14/12		11/14/12		11/14/12		11/13/12		11/13/12	
				QC Code		FS		FS		FS		FS		FS		FS	
				Lab Sample Delivery Group		480-28687-1		480-28600-1		480-28600-1		480-28600-1		480-28600-1		480-28600-1	
Frac	Method	Analyte	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
F	SW6010	Aluminum	mg/l	0.2 U		0.2 U		0.19 J		0.2 U		0.2 U		0.2 U		0.2 U	
F	SW6010	Chromium	mg/l	0.015		0.0029 J		0.098		0.0094		0.021		0.0091			
N	E300	Chloride	mg/l	13		190		92		110		18		19			
N	E300	Sulfate	mg/l	85		670		420		29		680		460			
N	E350.1	Nitrogen, as Ammonia	mg/l	1.3		110		43		21		47		38			
N	A2510B	LAB SPECIFIC CONDUCTANCE	umhos/cm	560		2400		1400		620		1800		1300			

Notes:

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F = filtered

FS = field sample

FD = field duplicate

U = not detected, value is the detection limit

J = value is estimated

mg/l = milligram per liter

umhos/cm = micromhos per centimeter

Prepared by / Date: KJC 12/12/12

Checked by / Date: MJW 12/13/12

Table 2
Final Results Summary
Data Validation Report
November 2012 Slurry Wall / Cap Groundwater, Surface Water and Sediment
Olin Chemical Superfund Site
Wilmington, Massachusetts

				ISCO1		ISCO2		ISCO3		PZ-16RR		PZ-17RR		PZ-18R		SD-17		SD-17	
Loc Name				ISCO1		ISCO2		ISCO3		PZ-16RR		PZ-17RR		PZ-18R		SD-17		SD-17	
Field Sample ID				OC-SW-ISCO1		OC-SW-ISCO2		OC-SW-ISCO3		OC-SW-PZ-16RRSW		OC-SW-PZ-17RRSW		OC-SW-PZ-18RSW		OC-SW-SD-17		OC-SW-SD-17-DUP	
Field Sample Date				11/16/12		11/16/12		11/16/12		11/16/12		11/16/12		11/16/12		11/16/12		11/16/12	
QC Code				FS		FS		FS		FS		FS		FS		FS		FD	
Lab Sample Delivery Group				480-28728-1		480-28728-1		480-28728-1		480-28728-1		480-28728-1		480-28728-1		480-28728-1		480-28728-1	
Frac	Method	Analyte	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
T	SW6010	Aluminum	mg/l	0.2		0.55		0.14 J		2.3		3.8		0.21		3.4		3.4	
T	SW6010	Chromium	mg/l	0.019		0.074		0.005 U		0.53		0.92		0.02		0.84		0.86	
T	SW6010	Sodium	mg/l	76		120		78		130		140		78		130		140	
F	SW6010	Aluminum	mg/l	0.17 J		0.14 J		0.2 U		1.1		0.93		0.12 J		0.95		0.98	
F	SW6010	Chromium	mg/l	0.017		0.031		0.005 U		0.3		0.36		0.015		0.36		0.36	
F	SW6010	Sodium	mg/l	81		120		78		130		140		79		140		140	
N	E300	Chloride	mg/l	110		140		150		140		160		110		170		170	
N	A2510B	LAB SPECIFIC CONDUCTANCE	umhos/cm	720		1,300		680		1,400		1,400		730		1,500		1,500	
N	E353.2	Nitrate as N	mg/l	0.34 J		2 J		1 J		1.3 J		0.69 J		0.35 J		0.6 J		0.61 J	
N	E353.2	Nitrite as N	mg/l	R		R		R		R		R		R		R		R	
N	E350.1	Nitrogen, as Ammonia	mg/l	23		50		1.1		52		58		24		61		60	
N	E300	Sulfate	mg/l	110		330		29		320		350		110		350		350	

Notes:

N = normal

T = total (unfiltered)

F = filtered

FS = field sample

FD = field duplicate

U = not detected, value is the detection limit

J = value is estimated

R = value is rejected

mg/l = milligram per liter

umhos/cm = micromhos per centimeter

Prepared by / Date: KJC 12/12/12

Checked by / Date: MJW 12/13/12

Table 2
Final Results Summary
Data Validation Report
November 2012 Slurry Wall / Cap Groundwater, Surface Water and Sediment
Olin Chemical Superfund Site
Wilmington, Massachusetts

				SD-SD1		SD-SD2		SD-SD3		SD-SD4		SD-SD5		SD-SD5	
				OC-SD-SD1		OC-SD-SD2		OC-SD-SD3		OC-SD-SD4		OC-SD-SD5		OC-SD-SD5-DUP	
				11/16/12		11/16/12		11/16/12		11/16/12		11/16/12		11/16/12	
				FS		FS		FS		FS		FS		FD	
				480-28730-1		480-28730-1		480-28730-1		480-28730-1		480-28730-1		480-28730-1	
Frac	Method	Analyte	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
T	SW6010	Aluminum	mg/kg	7,100	J	5,100	J	6,600	J	7,700	J	11,000	J	9,800	J
T	SW6010	Chromium	mg/kg	67		430		41		24		460		450	
T	SW6010	Iron	mg/kg	9,000		6,200		9,600		9,900		14,000		11,000	
N	E160.3	Percent Moisture	percent	26		21		24		34		34		39	
N	E160.3	Percent Solids	percent	74		79		76		66		66		61	

Notes:

N = normal

T = total (unfiltered)

FS = field sample

TB = trip blank

J = value is estimated

mg/kg = milligram per kilogram

Prepared by / Date: KJC 12/12/12

Checked by / Date: MJW 12/13/12

Table 3
Validation Qualification Action Summary
Data Validation Report
November 2012 Slurry Wall / Cap Groundwater, Surface Water and Sediment
Olin Chemical Superfund Site
Wilmington, Massachusetts

SDG	Lab Sample ID	Analytical Method	Fraction	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units
480-28728-1	480-28728-1	E353.2	N	OC-SW-ISCO1	Nitrate as N	0.34	H	0.34	J	HT-G	mg/l
480-28728-1	480-28728-1	E353.2	N	OC-SW-ISCO1	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28728-1	480-28728-2	E353.2	N	OC-SW-ISCO2	Nitrate as N	2	H	2	J	HT-G	mg/l
480-28728-1	480-28728-2	E353.2	N	OC-SW-ISCO2	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28728-1	480-28728-3	E353.2	N	OC-SW-ISCO3	Nitrate as N	1	H	1	J	HT-G	mg/l
480-28728-1	480-28728-3	E353.2	N	OC-SW-ISCO3	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28728-1	480-28728-4	E353.2	N	OC-SW-PZ-16RRSW	Nitrate as N	1.3	H	1.3	J	HT-G	mg/l
480-28728-1	480-28728-4	E353.2	N	OC-SW-PZ-16RRSW	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28728-1	480-28728-5	E353.2	N	OC-SW-PZ-17RRSW	Nitrate as N	0.69	H	0.69	J	HT-G	mg/l
480-28728-1	480-28728-5	E353.2	N	OC-SW-PZ-17RRSW	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28728-1	480-28728-6	E353.2	N	OC-SW-PZ-18RSW	Nitrate as N	0.35	H	0.35	J	HT-G	mg/l
480-28728-1	480-28728-6	E353.2	N	OC-SW-PZ-18RSW	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28728-1	480-28728-7	E353.2	N	OC-SW-SD-17	Nitrate as N	0.6	H	0.6	J	HT-G	mg/l
480-28728-1	480-28728-7	E353.2	N	OC-SW-SD-17	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28728-1	480-28728-8	E353.2	N	OC-SW-SD-17-DUP	Nitrate as N	0.61	H	0.61	J	HT-G	mg/l
480-28728-1	480-28728-8	E353.2	N	OC-SW-SD-17-DUP	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28730-1	480-28730-1	SW6010	T	OC-SD-SD1	Aluminum	7100		7100	J	MS-H, MS-L, MS-RPD	mg/kg
480-28730-1	480-28730-2	SW6010	T	OC-SD-SD2	Aluminum	5100		5100	J	MS-H, MS-L, MS-RPD	mg/kg
480-28730-1	480-28730-3	SW6010	T	OC-SD-SD3	Aluminum	6600		6600	J	MS-H, MS-L, MS-RPD	mg/kg
480-28730-1	480-28730-4	SW6010	T	OC-SD-SD4	Aluminum	7700		7700	J	MS-H, MS-L, MS-RPD	mg/kg
480-28730-1	480-28730-5	SW6010	T	OC-SD-SD5	Aluminum	11000		11000	J	MS-H, MS-L, MS-RPD	mg/kg
480-28730-1	480-28730-6	SW6010	T	OC-SD-SD5-DUP	Aluminum	9800		9800	J	MS-H, MS-L, MS-RPD	mg/kg

Units:

mg/l = milligram per liter
mg/kg = milligram per kilogram

Validation Qualifier:

J = Value is estimated
R = Value is rejected

Fraction

T = Total
N = Normal

Validation Reason Codes:

HT-G = Holding time for prep or analysis grossly exceeded
MS-H = MS and/or MSD recovery high
MS-L = MS and/or MSD recovery low
MS-RPD = MS/MSD RPD limit exceeded

Prepared by / Date: KJC 12/12/12
Checked by / Date: MJW 12/13/12

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
ICP METALS BY METHOD 6010B/200.7

Reviewer/Date Mike Washburn 12/11/12
Sr. Review/Date Chris Riccardi 1/18/13
Lab Report # 480-2860001
Project # 6107120016

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? Yes ☒ No ☐ N/A ☐ Comments:
Check items received.

☒ Name of Laboratory ☒ Address ☒ Project ID ☒ Phone # ☐ Sample identification – Field and Laboratory

Client Information: ☒ Name ☒ Address ☒ Client Contact (IDs must be cross-referenced)

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement

Yes ☒ No ☐ N/A ☐ Comments:

Does the laboratory report include a completed Analytical Report Certification in the required format?

ACTION: If no, contact lab for submission of missing certification or certification with correct format.

1.3 Laboratory Case Narrative:

Yes ☒ No ☐ N/A ☐ Comments:

☒ Narrative serves as an exception report for the project and method QA/QC performance. ☒ Narrative includes an explanation of each discrepancy on the

Certification Statement.

ACTION: If no, contact lab for submission of missing or illegible information.

1.4 Chain of Custody (COC) copy present with all documentation completed

Yes ☒ No ☐ N/A ☐ Comments:

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of completed COC.

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1.5 Sample Receipt Information (*Cooler Receipt Form present?*):

Yes ☒ No ☐ N/A ☐ Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

☒ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☒ Container type noted ☒ sample condition observed ☒ pH verified (where applicable) ☒ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were all samples delivered to the laboratory without breakage?

Yes ☒ No ☐ N/A ☐ Comments:

1.5.2 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes ☐ No ☒ N/A ☐ Comments:

1.6 Sample Results Section: Was each of the following requirements supplied in the laboratory report for each sample?

Yes ☒ No ☐ N/A ☐ Comments:

☒ Field ID and Lab ID ☒ Date and time collected ☒ Analyst Initials ☒ Dilution Factor ^{NA} ☐ % moisture or solids ☒ Reporting limits
^{NA} ☐ Clean-up method ☒ Analysis method ☒ Preparation method ☒ Date of preparation/extraction/digestion clean-up and analysis, where applicable
☒ Matrix ☒ Target analytes and concentrations ☒ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch?

Yes ☒ No ☐ N/A ☐ Comments:

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☒ Method blank results ☒ LCS recoveries ☒ MS/MSD recoveries and RPDs ☒ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for metals is 180 days from sample collection to analysis for both water and soil. Yes ☐ No ☒ N/A ☐ Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). If grossly exceeded (2X holding time) reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used? Yes ☒ No ☐ N/A ☐ Comments:

Water Digestion	3005A or 3010A or 3020A
Soil Digestion	3050B
Metals	6010B or 200.7

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the Yes ☒ No ☐ N/A ☐ Comments:
☐ SOW ☐ QAPP ☐ Lab ☐ MADEP

NOTE: Verify that the reported metals match the target list specified on the COC.

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ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are results present for each sample in the SDG?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.3 Is the method blank less than the PQLs for all target elements?

Yes ☒ No ☐ N/A ☐ Comments:

NOTE: *MADEP requires the method blank to be matrix matched and digested with the samples*

4.4 Do any method blanks have positive results for metals? Qualify data according to the following:

Yes ☐ No ☒ N/A ☐ Comments:

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If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = $5 \times$ the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less? Yes ☒ No ☐ N/A ☐ Comments:

NOTE: A full target, second source LCS is required by MADEP.

ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgement to evaluate data accuracy associated with that batch.

5.2 Is a LCS Summary Form present? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of MADEP control limits? Yes ☐ No ☒ N/A ☐ Comments:

Sample Type	MADEP % Rec
Water	80-120
Soil	within Lab generated limits

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and non-detects results within the batch as (J). If LCS recovery is $< 30\%$, positive and non-detect results are rejected (R).

Comments:

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6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

OC-GW-2021D

6.1 Were project-specific MS/MSDs collected? List project samples that were spiked. Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present? Yes ☒ No ☐ N/A ☐ Comments:

NOTE: A full target, second source MS/MSD is required by MADEP.

ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits? Yes ☐ No ☒ N/A ☐ Comments:

Sample Type	MADEP % Rec	QAPP % Rec	Method
Water	75-125	N/A	6010B
Water	N/A	70-130	200.7
Soil	75-125	75-125	6010B

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result
SR = Sample result
SA = Spike added

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

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NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes ☐ No ☒ N/A ☐ Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where: S = MS sample result
D = MSD sample result

NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Laboratory Duplicate

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? Yes ☐ No ☒ N/A ☐ Comments:

NOTE: MADEP refers to this sample as a "matrix duplicate".

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits? Yes ☐ No ☐ N/A ☒ Comments:

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<u>MADEP Laboratory Duplicate Sample RPD Criteria:</u>	<u>QAPP RPD</u>
For aqueous results > 5× RL, RPD must be ± 20%	20
For aqueous results < 5× RL, RPD must be ≤ RL	20
For soil/sediment results > 5× RL, RPD must be ± 35%	20
For soil/sediment results < 5× RL, RPD must be ≤ 2× RL	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist.

Yes ☐ No ☒ N/A ☐ Comments:

8.2 Do any rinsate blanks have positive results?

Yes ☐ No ☐ N/A ☒ Comments:

NOTE: MADEP does not require the collection of rinsate blanks.

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.

If the sample concentration is < 5 × blank value, flag sample result non-detect “U” at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates.

Yes ☒ No ☐ N/A ☐ Comments:

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9.2 Were field duplicates collected per the required frequency?

Yes ☒ No ☐ N/A ☐ Comments:

SOW ☐ QAPP (1 per 10) ☒ MADEP Option 1 (1 per 20) ☐ MADEP Option 3 (1 per 10) ☐

9.3 Was the RPD $\leq 50\%$ for soils or waters? Calculate the RPD for all results and attach to this review. Yes ☒ No ☐ N/A ☐ Comments:

ACTION: RPD must be $\leq 50\%$ for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Special QA/QC

10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal. Yes ☐ No ☒ N/A ☐ Comments:

ACTION: If results for both total and dissolved are $\geq 5x$ the PQL **and** the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than 5x the PQL **and** the **difference** exceeds 2x the PQL, flag both results as estimated (J)

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10.0 Application of Validation Qualifiers

Was any of the data qualified?

Yes ☐ No ☒ N/A ☐ Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

- LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999
- U.S. Environmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses"; Hazardous Site Evaluation Division; February 1989.
- MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.
- MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.
- MADEP, 2010. "Quality Control Requirements and Performance Standards for the Analysis of Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Final, Revision No. 1, 5 July 2010.

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Reviewer/Date Mike Washburn 12/12/12
 Sr. Review/Date Chris Riccardi 1/18/13
 Lab Report # 480-28687-1
 Project # 6107120018

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? Yes ☒ No ☐ N/A ☐ Comments:
 Check items received.

☒ Name of Laboratory ☒ Address ☒ Project ID ☒ Phone # ☒ Sample identification – Field and Laboratory
Client Information: ☒ Name ☒ Address ☒ Client Contact (IDs must be cross-referenced)

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement

Yes ☒ No ☐ N/A ☐ Comments:

Does the laboratory report include a completed Analytical Report Certification in the required format?

ACTION: If no, contact lab for submission of missing certification or certification with correct format.

1.3 Laboratory Case Narrative:

Yes ☒ No ☐ N/A ☐ Comments:

☒ Narrative serves as an exception report for the project and method QA/QC performance. ☒ Narrative includes an explanation of each discrepancy on the

Certification Statement.

ACTION: If no, contact lab for submission of missing or illegible information.

1.4 Chain of Custody (COC) copy present with all documentation completed

Yes ☒ No ☐ N/A ☐ Comments:

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of completed COC.

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1.5 Sample Receipt Information (*Cooler Receipt Form present?*):

Yes ☒ No ☐ N/A ☐ Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

- ☒ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).
- ☒ Container type noted ☒ sample condition observed ☒ pH verified (where applicable) ☒ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were all samples delivered to the laboratory without breakage?

Yes ☒ No ☐ N/A ☐ Comments:

1.5.2 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes ☐ No ☒ N/A ☐ Comments:

1.6 Sample Results Section: Was each of the following requirements supplied in the laboratory report for each sample?

Yes ☒ No ☐ N/A ☐ Comments:

- | | | | | | |
|---|--|--|--|--|--|
| <input checked="" type="checkbox"/> Field ID and Lab ID | <input checked="" type="checkbox"/> Date and time collected | <input checked="" type="checkbox"/> Analyst Initials | <input checked="" type="checkbox"/> Dilution Factor | <input checked="" type="checkbox"/> % moisture or solids | <input checked="" type="checkbox"/> Reporting limits |
| <input checked="" type="checkbox"/> Clean-up method | <input checked="" type="checkbox"/> Analysis method | <input checked="" type="checkbox"/> Preparation method | <input checked="" type="checkbox"/> Date of preparation/extraction/digestion clean-up and analysis, where applicable | | |
| <input checked="" type="checkbox"/> Matrix | <input checked="" type="checkbox"/> Target analytes and concentrations | <input checked="" type="checkbox"/> Units (soils must be reported in dry weight) | | | |

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch?

Yes ☒ No ☐ N/A ☐ Comments:

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☒ Method blank results ☒ LCS recoveries ☒ MS/MSD recoveries and RPDs ☒ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for metals is 180 days from sample collection to analysis for both water and soil. Yes ☐ No ☒ N/A ☐ Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). If grossly exceeded (2X holding time) reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used? Yes ☒ No ☐ N/A ☐ Comments:

Water Digestion	3005A or 3010A or 3020A
Soil Digestion	3050B
Metals	6010B or 200.7

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the Yes ☒ No ☐ N/A ☐ Comments:
☐ SOW ☒ QAPP ☐ Lab ☐ MADEP

NOTE: Verify that the reported metals match the target list specified on the COC.

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ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are results present for each sample in the SDG?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.3 Is the method blank less than the PQLs for all target elements?

Yes ☒ No ☐ N/A ☐ Comments:

NOTE: *MADEP requires the method blank to be matrix matched and digested with the samples*

4.4 Do any method blanks have positive results for metals? Qualify data according to the following:

Yes ☐ No ☒ N/A ☐ Comments:

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If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = $5 \times$ the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less? Yes ☒ No ☐ N/A ☐ Comments:

NOTE: A full target, second source LCS is required by MADEP.

ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgement to evaluate data accuracy associated with that batch.

5.2 Is a LCS Summary Form present? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of MADEP control limits? Yes ☐ No ☒ N/A ☐ Comments:

<u>Sample Type</u>	<u>MADEP % Rec</u>
Water	80-120
Soil	within Lab generated limits

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and non-detects results within the batch as (J). If LCS recovery is $< 30\%$, positive and non-detect results are rejected (R).

Comments:

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6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs collected? List project samples that were spiked. Yes ☐ No ☒ N/A ☐ Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present? Yes ☐ No ☐ N/A ☒ Comments:

NOTE: A full target, second source MS/MSD is required by MADEP.

ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule? Yes ☐ No ☐ N/A ☒ Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits? Yes ☐ No ☐ N/A ☒ Comments:

<u>Sample Type</u>	<u>MADEP % Rec</u>	<u>QAPP % Rec</u>	<u>Method</u>
Water	75-125	N/A	6010B
Water	N/A	70-130	200.7
Soil	75-125	75-125	6010B

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$

Where: SSR = Spiked sample result
SR = Sample result
SA = Spike added

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

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NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes ☐ No ☐ N/A ☒ Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where: S = MS sample result
D = MSD sample result

NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Laboratory Duplicate

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? Yes ☐ No ☒ N/A ☐ Comments:

NOTE: MADEP refers to this sample as a “matrix duplicate”.

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits? Yes ☐ No ☐ N/A ☒ Comments:

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<i>MADEP Laboratory Duplicate Sample RPD Criteria:</i>	<u>QAPP RPD</u>
<i>For aqueous results > 5×RL, RPD must be ± 20%</i>	20
<i>For aqueous results < 5×RL, RPD must be ≤ RL</i>	20
<i>For soil/sediment results > 5×RL, RPD must be ± 35%</i>	20
<i>For soil/sediment results < 5×RL, RPD must be ≤ 2×RL</i>	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist.

Yes ☐ No ☒ N/A ☐ Comments:

8.2 Do any rinsate blanks have positive results?

Yes ☐ No ☐ N/A ☒ Comments:

NOTE: MADEP does not require the collection of rinsate blanks.

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.

If the sample concentration is < 5 × blank value, flag sample result non-detect “U” at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates.

Yes ☐ No ☒ N/A ☐ Comments:

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9.2 Were field duplicates collected per the required frequency?

Yes ☐ No ☐ N/A ☒ Comments:

SOW ☐ QAPP (1 per 10) ☐ MADEP Option 1 (1 per 20) ☐ MADEP Option 3 (1 per 10) ☐

9.3 Was the RPD $\leq 50\%$ for soils or waters? Calculate the RPD for all results and attach to this review. Yes ☐ No ☐ N/A ☒ Comments:

ACTION: RPD must be $\leq 50\%$ for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Special QA/QC

10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal. Yes ☐ No ☒ N/A ☐ Comments:

ACTION: If results for both total and dissolved are $\geq 5x$ the PQL **and** the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than 5x the PQL **and** the **difference** exceeds 2x the PQL, flag both results as estimated (J)

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LEVEL I DATA QUALITY EVALUATION – OPTION 1
STANDARD OPERATING PROCEDURE AND CHECKLIST
ICP METALS BY METHOD 6010B/200.7

10.0 Application of Validation Qualifiers

Was any of the data qualified?

Yes ☐ No ☒ N/A ☐ Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

- LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999
- U.S. Environmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses"; Hazardous Site Evaluation Division; February 1989.
- MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.
- MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.
- MADEP, 2010. "Quality Control Requirements and Performance Standards for the Analysis of Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Final, Revision No. 1, 5 July 2010.

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
ICP METALS BY METHOD 6010B/200.7

Reviewer/Date Mike Waggoner 12/12/12
Sr. Review/Date Chns Ricardi 1/18/13
Lab Report # 480-28728
Project # 6107120016

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? Yes ☒ No ☐ N/A ☐ Comments:
Check items received.

☒ Name of Laboratory ☒ Address ☒ Project ID ☒ Phone # ☒ Sample identification – Field and Laboratory
Client Information: ☒ Name ☒ Address ☒ Client Contact (IDs must be cross-referenced)

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement

Yes ☒ No ☐ N/A ☐ Comments:

Does the laboratory report include a completed Analytical Report Certification in the required format?

ACTION: If no, contact lab for submission of missing certification or certification with correct format.

1.3 Laboratory Case Narrative:

Yes ☒ No ☐ N/A ☐ Comments:

☒ Narrative serves as an exception report for the project and method QA/QC performance. ☒ Narrative includes an explanation of each discrepancy on the

Certification Statement.

ACTION: If no, contact lab for submission of missing or illegible information.

1.4 Chain of Custody (COC) copy present with all documentation completed

Yes ☒ No ☐ N/A ☐ Comments:

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of completed COC.

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1.5 Sample Receipt Information (*Cooler Receipt Form present?*):

Yes ☒ No ☐ N/A ☐ Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

☒ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☒ Container type noted ☒ sample condition observed ☒ pH verified (where applicable) ☒ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were all samples delivered to the laboratory without breakage?

Yes ☒ No ☐ N/A ☐ Comments:

1.5.2 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes ☐ No ☒ N/A ☐ Comments:

1.6 Sample Results Section: Was each of the following requirements supplied in the laboratory report for each sample?

Yes ☒ No ☐ N/A ☐ Comments:

<input checked="" type="checkbox"/> Field ID and Lab ID	<input checked="" type="checkbox"/> Date and time collected	<input checked="" type="checkbox"/> Analyst Initials	<input checked="" type="checkbox"/> Dilution Factor	<input checked="" type="checkbox"/> % moisture or solids	<input checked="" type="checkbox"/> Reporting limits
<input checked="" type="checkbox"/> Clean-up method	<input checked="" type="checkbox"/> Analysis method	<input checked="" type="checkbox"/> Preparation method	<input checked="" type="checkbox"/> Date of preparation/extraction/digestion clean-up and analysis, where applicable		
<input checked="" type="checkbox"/> Matrix	<input checked="" type="checkbox"/> Target analytes and concentrations	<input checked="" type="checkbox"/> Units (soils must be reported in dry weight)			

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch?

Yes ☒ No ☐ N/A ☐ Comments:

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☒ Method blank results ☒ LCS recoveries ☒ MS/MSD recoveries and RPDs ☒ Laboratory duplicate results (where applicable) ^{N/A}

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for metals is 180 days from sample collection to analysis for both water and soil. Yes ☐ No ☒ N/A ☐ Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). If grossly exceeded (2X holding time) reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used? Yes ☒ No ☐ N/A ☐ Comments:

Water Digestion	3005A or 3010A or 3020A
Soil Digestion	3050B
Metals	6010B or 200.7

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the Yes ☒ No ☐ N/A ☐ Comments:
☐ SOW ☒ QAPP ☐ Lab ☐ MADEP

NOTE: Verify that the reported metals match the target list specified on the COC.

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ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are results present for each sample in the SDG?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.3 Is the method blank less than the PQLs for all target elements?

Yes ☒ No ☐ N/A ☐ Comments:

NOTE: MADEP requires the method blank to be matrix matched and digested with the samples

4.4 Do any method blanks have positive results for metals? Qualify data according to the following:

Yes ☐ No ☒ N/A ☐ Comments:

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If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = $5 \times$ the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less? Yes ☒ No ☐ N/A ☐ Comments:

NOTE: A full target, second source LCS is required by MADEP.

ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgement to evaluate data accuracy associated with that batch.

5.2 Is a LCS Summary Form present? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of MADEP control limits? Yes ☐ No ☒ N/A ☐ Comments:

Sample Type	MADEP % Rec
Water	80-120
Soil	within Lab generated limits

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and non-detects results within the batch as (J). If LCS recovery is $< 30\%$, positive and non-detect results are rejected (R).

Comments:

OLIN CORPORATION

LEVEL I DATA QUALITY EVALUATION – OPTION 1

STANDARD OPERATING PROCEDURE AND CHECKLIST

ICP METALS BY METHOD 6010B/200.7

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

OC-SW-SP-17

6.1 Were project-specific MS/MSDs collected? List project samples that were spiked. **Yes** ☒ **No** ☐ **N/A** ☐ **Comments:**

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present? Yes ☒ No ☐ N/A ☐ Comments:

NOTE: A full target, second source MS/MSD is required by MADEP.

ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule? **Yes** ☒ **No** ☐ **N/A** ☐ **Comments:**

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits? Yes [] **No** [☒] N/A [] Comments:

Sample Type	<i>MADEP</i> % <i>Rec</i>	QAPP % Rec	Method
Water	75-125	N/A	6010B
Water	N/A	70-130	200.7
Soil	75-125	75-125	6010B

NOTE: %R = $\frac{(SSR-SR)}{SA} \times 100\%$

Where: SSR = Spiked sample result
SR = Sample result
SA = Spike added

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

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NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes ☐ No ☒ N/A ☐ Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where: S = MS sample result
D = MSD sample result

NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Laboratory Duplicate

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? Yes ☐ No ☒ N/A ☐ Comments:

NOTE: MADEP refers to this sample as a “matrix duplicate”.

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits? Yes ☐ No ☐ N/A ☒ Comments:

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<u>MADEP Laboratory Duplicate Sample RPD Criteria:</u>	<u>QAPP RPD</u>
For aqueous results > 5× RL, RPD must be ± 20%	20
For aqueous results < 5× RL, RPD must be ≤ RL	20
For soil/sediment results > 5× RL, RPD must be ± 35%	20
For soil/sediment results < 5× RL, RPD must be ≤ 2× RL	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist.

Yes ☐ No ☒ N/A ☐ Comments:

8.2 Do any rinsate blanks have positive results?

Yes ☐ No ☐ N/A ☒ Comments:

NOTE: MADEP does not require the collection of rinsate blanks.

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.

If the sample concentration is < 5 × blank value, flag sample result non-detect “U” at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates.

Yes ☒ No ☐ N/A ☐ Comments:

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9.2 Were field duplicates collected per the required frequency?

Yes ☒ No ☐ N/A ☐ Comments:

SOW ☐ QAPP (1 per 10) ☐ MADEP Option 1 (1 per 20) ☐ MADEP Option 3 (1 per 10) ☐

9.3 Was the RPD $\leq 50\%$ for soils or waters? Calculate the RPD for all results and attach to this review. Yes ☒ No ☐ N/A ☐ Comments:

ACTION: RPD must be $\leq 50\%$ for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Special QA/QC

10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal. Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If results for both total and dissolved are $\geq 5x$ the PQL **and** the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than 5x the PQL **and** the **difference** exceeds 2x the PQL, flag both results as estimated (J)

Sodium dissolved
exceeded total fraction
but $< 10\%$. no action
required.

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STANDARD OPERATING PROCEDURE AND CHECKLIST
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10.0 Application of Validation Qualifiers

Was any of the data qualified?

Yes ☐

No ☒

N/A ☐

Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

- LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999
- U.S. Environmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses"; Hazardous Site Evaluation Division; February 1989.
- MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.
- MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.
- MADEP, 2010. "Quality Control Requirements and Performance Standards for the Analysis of Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Final, Revision No. 1, 5 July 2010.

Field Duplicate

fraction	lab_sample_id	field_sample_id	qc_code	param_name	final_result	Average	Difference	RPD
D	480-28728-7	OC-SW-SD-17	FS	Aluminum	0.95	0.965	0.03	3%
D	480-28728-8	OC-SW-SD-17-DUP	FD	Aluminum	0.98			
T	480-28728-7	OC-SW-SD-17	FS	Aluminum	3.4	3.4	0	0%
T	480-28728-8	OC-SW-SD-17-DUP	FD	Aluminum	3.4			
D	480-28728-7	OC-SW-SD-17	FS	Chromium	0.36	0.36	0	0%
D	480-28728-8	OC-SW-SD-17-DUP	FD	Chromium	0.36			
T	480-28728-7	OC-SW-SD-17	FS	Chromium	0.84	0.85	0.02	2%
T	480-28728-8	OC-SW-SD-17-DUP	FD	Chromium	0.86			
D	480-28728-7	OC-SW-SD-17	FS	Sodium	140	140	0	0%
D	480-28728-8	OC-SW-SD-17-DUP	FD	Sodium	140			
T	480-28728-7	OC-SW-SD-17	FS	Sodium	130	135	10	7%
T	480-28728-8	OC-SW-SD-17-DUP	FD	Sodium	140			

msw
12/12/12

Dissolved / Total Comparison

fraction	lab_sample_id	field_sample_id	qc_code	param_name	final_result	QC Limit
D	480-28728-1	OC-SW-ISCO1	FS	Sodium	81	83.6
T	480-28728-1	OC-SW-ISCO1	FS	Sodium	76	
D	480-28728-6	OC-SW-PZ-18RSW	FS	Sodium	79	85.8
T	480-28728-6	OC-SW-PZ-18RSW	FS	Sodium	78	
D	480-28728-7	OC-SW-SD-17	FS	Sodium	140	143
T	480-28728-7	OC-SW-SD-17	FS	Sodium	130	

mjw
12/12/12

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STANDARD OPERATING PROCEDURE AND CHECKLIST
ICP METALS BY METHOD 6010B/200.7

Reviewer/Date Mike Washburn 12/12/12
Sr. Review/Date Chris Record 1/18/13
Lab Report # 480-28730
Project # 6107120016

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? Yes ☒ No ☐ N/A ☐ Comments:
Check items received.

☒ Name of Laboratory ☒ Address ☒ Project ID ☒ Phone # ☒ Sample identification – Field and Laboratory
Client Information: ☒ Name ☒ Address ☒ Client Contact (IDs must be cross-referenced)

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement

Yes ☒ No ☐ N/A ☐ Comments:

Does the laboratory report include a completed Analytical Report Certification in the required format?

ACTION: If no, contact lab for submission of missing certification or certification with correct format.

1.3 Laboratory Case Narrative:

Yes ☒ No ☐ N/A ☐ Comments:

☒ Narrative serves as an exception report for the project and method QA/QC performance. ☒ Narrative includes an explanation of each discrepancy on the

Certification Statement.

ACTION: If no, contact lab for submission of missing or illegible information.

1.4 Chain of Custody (COC) copy present with all documentation completed

Yes ☒ No ☐ N/A ☐ Comments:

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of completed COC.

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1.5 Sample Receipt Information (*Cooler Receipt Form present?*):

Yes ☒ No ☐ N/A ☐ Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

☒ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☒ Container type noted ☒ sample condition observed ☒ pH verified (where applicable) ☒ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were all samples delivered to the laboratory without breakage?

Yes ☒ No ☐ N/A ☐ Comments:

1.5.2 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes ☐ No ☒ N/A ☐ Comments:

1.6 Sample Results Section: Was each of the following requirements supplied in the laboratory report for each sample?

Yes ☒ No ☐ N/A ☐ Comments:

☒ Field ID and Lab ID ☒ Date and time collected ☒ Analyst Initials ☒ Dilution Factor ☒ % moisture or solids ☒ Reporting limits
☒ Clean-up method ☒ Analysis method ☒ Preparation method ☒ Date of preparation/extraction/digestion clean-up and analysis, where applicable
☒ Matrix ☒ Target analytes and concentrations ☒ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch?

Yes ☒ No ☐ N/A ☐ Comments:

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☒ Method blank results ☒ LCS recoveries ☒ MS/MSD recoveries and RPDs ☒ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for metals is 180 days from sample collection to analysis for both water and soil. Yes ☐ No ☒ N/A ☐ Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). If grossly exceeded (2X holding time) reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used? Yes ☒ No ☐ N/A ☐ Comments:

Water Digestion	3005A or 3010A or 3020A
Soil Digestion	3050B
Metals	6010B or 200.7

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the Yes ☒ No ☐ N/A ☐ Comments:
☐ SOW ☒ QAPP ☐ Lab ☐ MADEP

NOTE: Verify that the reported metals match the target list specified on the COC.

12/12/12
ms
Iron pql is 8. Lab used
9.7. No action required, iron
detected in all samples

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ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are results present for each sample in the SDG?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.3 Is the method blank less than the PQLs for all target elements?

Yes ☒ No ☐ N/A ☐ Comments:

NOTE: MADEP requires the method blank to be matrix matched and digested with the samples

4.4 Do any method blanks have positive results for metals? Qualify data according to the following:

Yes ☒ No ☐ N/A ☐ Comments:

IRON - 3.78 mg/kg => SX = 18.9 mg/kg

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If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = $5 \times$ the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less? Yes ☒ No ☐ N/A ☐ Comments:

NOTE: A full target, second source LCS is required by MADEP.

ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgement to evaluate data accuracy associated with that batch.

5.2 Is a LCS Summary Form present? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of MADEP control limits? Yes ☐ No ☒ N/A ☐ Comments:

<u>Sample Type</u>	<u>MADEP % Rec</u>
Water	80-120
Soil	within Lab generated limits

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and non-detects results within the batch as (J). If LCS recovery is $< 30\%$, positive and non-detect results are rejected (R).

Comments:

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6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

OC-SD-SPS

6.1 Were project-specific MS/MSDs collected? List project samples that were spiked. Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present? Yes ☒ No ☐ N/A ☐ Comments:

NOTE: A full target, second source MS/MSD is required by MADEP.

ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits? Yes ☒ No ☐ N/A ☐ Comments:

Sample Type	MADEP % Rec	QAPP % Rec	Method
Water	75-125	N/A	6010B
Water	N/A	70-130	200.7
Soil	75-125	75-125	6010B

NOTE: %R = $\frac{(SSR-SR)}{SA} \times 100\%$

Where: SSR = Spiked sample result
 SR = Sample result
 SA = Spike added

MSD MS RPD
 Cr -252 => sample > 4x spike
 Al -36 148 44
 Fe -117 => sample > 4x spike
 qualified results estimated

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

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NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits?

Yes ☒ No ☐ N/A ☐ Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$

Where: S = MS sample result
D = MSD sample result

Aluminum - 44

NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 **Laboratory Duplicate**

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? Yes ☐ No ☒ N/A ☐ Comments:

NOTE: MADEP refers to this sample as a "matrix duplicate".

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits?

Yes ☐ No ☐ N/A ☒ Comments:

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<u>MADEP Laboratory Duplicate Sample RPD Criteria:</u>	<u>QAPP RPD</u>
For aqueous results $> 5 \times RL$, RPD must be $\pm 20\%$	20
For aqueous results $< 5 \times RL$, RPD must be $\leq RL$	20
For soil/sediment results $> 5 \times RL$, RPD must be $\pm 35\%$	20
For soil/sediment results $< 5 \times RL$, RPD must be $\leq 2 \times RL$	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist.

Yes ☐ No ☒ N/A ☐ Comments:

8.2 Do any rinsate blanks have positive results?

Yes ☐ No ☐ N/A ☒ Comments:

NOTE: MADEP does not require the collection of rinsate blanks.

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.

If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates.

Yes ☒ No ☐ N/A ☐ Comments:

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9.2 Were field duplicates collected per the required frequency?

Yes ☒ No ☐ N/A ☐ Comments:

SOW ☒ QAPP (1 per 10) ☐ MADEP Option 1 (1 per 20) ☐ MADEP Option 3 (1 per 10) ☐

9.3 Was the RPD $\leq 50\%$ for soils or waters? Calculate the RPD for all results and attach to this review. Yes ☒ No ☐ N/A ☐ Comments:

ACTION: RPD must be $\leq 50\%$ for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Special QA/QC

10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal. Yes ☐ No ☒ N/A ☐ Comments:

ACTION: If results for both total and dissolved are $\geq 5x$ the PQL **and** the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than 5x the PQL **and** the **difference** exceeds 2x the PQL, flag both results as estimated (J)

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10.0 Application of Validation Qualifiers

Was any of the data qualified?

Yes ☒ No ☐ N/A ☐ Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

- LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999
- U.S. Environmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses"; Hazardous Site Evaluation Division; February 1989.
- MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.
- MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.
- MADEP, 2010. "Quality Control Requirements and Performance Standards for the Analysis of Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Final, Revision No. 1, 5 July 2010.

QC Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Wilmington MA Superfund S

TestAmerica Job ID: 480-28730-1

Method: 6010 - Metals (ICP)

Lab Sample ID: MB 480-92192/1-A

Matrix: Solid

Analysis Batch: 92420

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 92192

Analyte	MB MB Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	ND	0.49	0.19	mg/Kg		11/21/12 10:20	11/21/12 21:03	1
Aluminum	ND	9.7	4.3	mg/Kg		11/21/12 10:20	11/21/12 21:03	1
Iron	3.78 J	9.7	1.1	mg/Kg		11/21/12 10:20	11/21/12 21:03	1

Lab Sample ID: LCDSRM 480-92192/3-A LCDSRM

Matrix: Solid

Analysis Batch: 92420

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 92192

Analyte	Spike Added	LCDSRM Result	LCDSRM Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	Limit
Chromium	351	113		mg/Kg		32.1	23.6 - 43.9	2	20
Aluminum	68200	7640		mg/Kg		11.2	5.9 - 21.4	3	20
Iron	42900	11100		mg/Kg		25.9	9.8 - 50.8	0	20

Lab Sample ID: LCSSRM 480-92192/2-A

Matrix: Solid

Analysis Batch: 92420

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 92192

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	Limit
Chromium	351	115		mg/Kg		32.6	23.6 - 43.9		
Aluminum	68100	7900		mg/Kg		11.6	5.9 - 21.4		
Iron	42900	11100		mg/Kg		26.0	9.8 - 50.8		

Lab Sample ID: 480-28730-5 MS

Matrix: Solid

Analysis Batch: 92420

Client Sample ID: OC-SD-SD5

Prep Type: Total/NA

Prep Batch: 92192

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	Limit
Chromium	4x 460		59.8	505	4	mg/Kg	*	69	75 - 125		
Aluminum	11000		2990	15100	F	mg/Kg	*	148	75 - 125		
Iron	4x 14000 B		2990	15900	4	mg/Kg	*	55	75 - 125		

Lab Sample ID: 480-28730-5 MSD

Matrix: Solid

Analysis Batch: 92420

Client Sample ID: OC-SD-SD5

Prep Type: Total/NA

Prep Batch: 92192

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	Limit
Chromium	4x 460		56.8	321	4 F	mg/Kg	*	252	75 - 125	45	35
Aluminum	11000		2840	9650	F	mg/Kg	*	-36	75 - 125	44	35
Iron	4x 14000 B		2840	10900	4 F	mg/Kg	*	-117	75 - 125	37	35

TestAmerica Buffalo

MSD
12/12/12

Field Duplicate

lab_sample_id	field_sample_id	qc_code	param_name	final_result	average	difference	RPD
480-28730-5	OC-SD-SD5	FS	Aluminum	11000	10400	1200	12%
480-28730-6	OC-SD-SD5-DUP	FD	Aluminum	9800			
480-28730-5	OC-SD-SD5	FS	Chromium	460	455	10	2%
480-28730-6	OC-SD-SD5-DUP	FD	Chromium	450			
480-28730-5	OC-SD-SD5	FS	Iron	14000	12500	3000	24%
480-28730-6	OC-SD-SD5-DUP	FD	Iron	11000			

MSW
12/12/12

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Reviewer/Date Mike Washburn 12/12/12
 Sr. Review/Date Chris Ricard 1/18/13
 Lab Report # 490-28600-1
 Project # 6107120016

Chloride, Sulfate
Ammonia, Conductivity

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? Yes ☒ No ☐ N/A ☐ Comments:
 Check items received.

☒ Name of Laboratory ☒ Address ☒ Project ID ☒ Phone # ☒ Sample identification – Field and Laboratory
 Client Information: ☒ Name ☒ Address ☒ Client Contact (IDs must be cross-referenced)

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 **Laboratory Report Certification Statement**

Yes ☒ No ☐ N/A ☐ Comments:

Does the laboratory report include a completed Analytical Report Certification in the required format?

ACTION: If no, contact lab for submission of missing certification or certification with correct format.

1.3 **Laboratory Case Narrative:**

Yes ☒ No ☐ N/A ☐ Comments:

☒ Narrative serves as an exception report for the project and method QA/QC performance. ☒ Narrative includes an explanation of each discrepancy on the Certification Statement.

ACTION: If no, contact lab for submission of missing or illegible information.

1.4 **Chain of Custody (COC)** copy present with all documentation completed?

Yes ☒ No ☐ N/A ☐ Comments:

Does the laboratory report include copies of Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of missing completed COC.

1.5 Sample Receipt Information (Cooler Receipt Form): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

Yes ☒ No ☐ N/A ☐ Comments:

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☒ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☒ Container type noted ☒ Condition observed ☒ pH verified (where applicable) ☒ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used?

Yes ☒ No ☐ N/A ☐ Comments:

Ammonia, – 1 Liter polyethylene/H₂SO₄ to pH<2, cool to 4°C

Oil & Grease – 1 Liter glass/HCL or H₂SO₄ to pH<2, cool to 4°C

Alkalinity – 1 Liter polyethylene/cool to 4°C

Chemical Oxygen Demand – 50 mL polyethylene/H₂SO₄ to pH<2, cool to 4°C

Chloride, pH, sulfate, nitrate, nitrite - 50 mL polyethylene/cool to 4°C

Nitrate/nitrite - H₂SO₄ to pH<2, cool to 4°C

Organic Carbon – 500 mL amber glass bottle/HCl or H₂SO₄ to pH<2, cool to 4°C

Sulfide – 50 mL polyethylene/ZnAcetate + NaOH to pH>9, cool to 4°C

Phenolics - H₂SO₄ to pH<2, cool to 4°C

Specific conductance, TDS, TSS – 100 mL polyethylene/cool to 4°C

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

1.5.2 Were all samples delivered to the laboratory without breakage?

Yes ☒ No ☐ N/A ☐ Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes ☐ No ☒ N/A ☐ Comments:

1.6 Sample Results Section: Was the following information supplied in the laboratory report for each sample?

Yes ☒ No ☐ N/A ☐ Comments:

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- ☒ Field ID and Lab ID ☒ Date and time collected ☒ Analyst Initials ☒ Dilution Factor ☒ % moisture or solids ☒ Reporting limits
N/A ☒ Clean-up method ☒ Analysis method ☒ Preparation method ☒ Date of preparation/extraction/digestion clean-up and analysis, where applicable
☒ Matrix ☒ Target analytes and concentrations ☒ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? Yes ☒ No ☐ N/A ☐ Comments:

- ☒ Method blank results ☒ LCS recoveries ☒ MS/MSD recoveries and RPDs ☒ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Yes ☐ No ☒ N/A ☐ Comments:

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? The holding times are as follows:

28 days = ammonia, chemical oxygen demand, chloride, organic carbon, oil & grease, specific conductance, total organic carbon and sulfate

Alkalinity = 14 days Sulfide, TDS, TSS = 7 days pH = analyze immediately Nitrate nitrogen as N = 48 hrs

Nitrite nitrogen as N = 48 hrs Nitrate + Nitrite as N = 28 days

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded qualify results (J). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. Professional judgment used to qualify soils.

3.0 Laboratory Method

Yes ☒ No ☐ N/A ☐ Comments:

3.1 Was the correct laboratory method used?

ACTION: If no, contact lab to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change or to request variance.

3.2 Are the practical quantitation limits the same as those specified by the Yes ☒ No ☐ N/A ☐ Comments:
☐ QAPP/IRSWP ☐ Lab?

Note: The MADEP QA/QC Guidelines do not yet list PQLs for wet chemistry analyses,

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therefore all criteria will default to values stipulated in the QAPP*. Where the QAPP does not define criteria, QA/QC requirements default to limits employed by the lab**. Other criteria may also apply.

Ammonia* <input checked="" type="checkbox"/> = 0.1 mg/ L	Alkalinity** <input type="checkbox"/> = 1 mg/L	Bicarbonate Alkalinity** <input type="checkbox"/> = 1 mg/L	Carbonate Alkalinity** <input type="checkbox"/> = 1 mg/L
Nitrate Nitrogen as N* <input type="checkbox"/> = .05 mg/L	Nitrite Nitrogen as N* <input type="checkbox"/> = .01 mg/L	Chloride* <input checked="" type="checkbox"/> = 1 mg/L	Hardness * <input type="checkbox"/> = 2 mg/L
Spec. Cond.** <input checked="" type="checkbox"/> 3 umhos/cm	Total Organic Carbon** <input type="checkbox"/> = 1 mg/L	Oil & Grease* <input type="checkbox"/> = 5.5 mg/L	Sulfate (EPA 300.0)* <input checked="" type="checkbox"/> = 2 mg/L
COD:* Low - 20 mg/L	COD* High - 50 mg/L <input type="checkbox"/>	TDS* <input type="checkbox"/> = 10 mg/L	TSS* <input type="checkbox"/> = 5 mg/L
pH* <input type="checkbox"/> < 2 to > 12	Phenolic - 0.01 mg/L		
Other parameter(list) _____	PQL = _____	<input type="checkbox"/> Source of PQL = _____	
Other parameter(list) _____	PQL = _____	<input type="checkbox"/> Source of PQL = _____	

ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate parameter results present for each sample in the SDG?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

Yes ☒ No ☐ N/A ☐ Comments:

4.1 Are the Method Blank Summaries present?

ACTION: If no, call the laboratory for submission of missing data.

4.2 Was a method blank analyzed for each analysis batch of wet chemistry field samples of 20 or less?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

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4.3 Is the method blank less than the PQL? (See Section 3.2 for PQLs).

Yes ☒ No ☐ N/A ☐ Comments:

4.4 Do any method blanks have positive results for wet chemistry parameters? Qualify data according to the following:

Yes ☐ No ☒ N/A ☐ Comments:

If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

ACTION: If any blank has positive results, list all the concentrations detected and flagging level (flagging level = $5 \times$ blank value) on the checklist. List all affected samples and their qualifiers.

5.0 Laboratory Control Standards

5.1 Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, call laboratory for LCS form submittal. If data is not available, use professional judgment to determine qualification actions for data associated with the batch.

5.2 Is a LCS Summary Form present?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is any wet chemistry analyte LCS recovery outside the control limits?

Yes ☐ No ☒ N/A ☐ Comments:

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LCS Limits:

Alkalinity** <input type="checkbox"/> = 80-120%	Bicarbonate Alkalinity** <input type="checkbox"/> = 80-120%	Carbonate Alkalinity** <input type="checkbox"/> = 80-120%	Specific Conductivity * <input checked="" type="checkbox"/> = 80-120%
Total Organic Carbon** <input type="checkbox"/> = 80-120%	TDS** <input type="checkbox"/> = 80-120%	Oil & Grease* <input type="checkbox"/> = 80-120%	Ammonia Nitrogen as N* <input checked="" type="checkbox"/> = 80-120%
COD Low* <input type="checkbox"/> = 80-120%	COD High* <input type="checkbox"/> = 80-120%	Nitrate Nitrogen as N** <input type="checkbox"/> = 80-120%	Nitrite Nitrogen as N** <input type="checkbox"/> = 80-120%
Hardness* <input type="checkbox"/> = 80-120%	Chloride* <input checked="" type="checkbox"/> = 80-120%	Sulfate (EPA 300.0)* <input checked="" type="checkbox"/> = 80-120%	pH* <input type="checkbox"/> = 98-102% TSS* NA

Other parameter(list) _____ %R = _____ ☐ Rec Limits= _____

Other parameter(list) _____ %R = _____ ☐ Rec Limits = _____

(MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs analyzed? List project samples that were spiked.

ACTION: If no, contact senior chemist to see if any were specified.

Yes ☒ No ☐ N/A ☐ Comments:

OC-GW-202D
OC-GW-25
OC-PZ-25

6.2 Is the MS/MSD Recovery Form present?

ACTION: If no, contact lab for resubmission of missing data.

Yes ☒ No ☐ N/A ☐ Comments:

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix?

Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If any matrix spike data is missing, call lab for resubmission.

6.4 Are any wet chemistry analyte spike recoveries outside of the QC limits?

Yes ☐ No ☒ N/A ☐ Comments:

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NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$

Where: SSR = Spiked sample result
 SR = Sample result

SA = Spike added

MS/MSD Recovery Limits:

Alkalinity* = NA	Bicarbonate Alkalinity* = NA	Carbonate alkalinity* = NA	Ammonia* (LACHAT) <input checked="" type="checkbox"/> = 75-125%
Chloride*(SM 4500 Cl) <input checked="" type="checkbox"/> = 75-125%	Specific Conductivity * = NA	Total Organic Carbon* = NA	TDS** = NA
Oil & Grease* = NA	COD Low* <input type="checkbox"/> = 75-125%	COD High* <input type="checkbox"/> = 75-125%	Nitrate Nitrogen as N** <input type="checkbox"/> = 75-125%
Nitrite Nitrogen as N** <input type="checkbox"/> = 75-125%	Hardness* <input type="checkbox"/> = 75-125%	Sulfate (EPA 300.0)* <input checked="" type="checkbox"/> = 75-125%	pH* = NA TSS* = NA
Other parameter(list) _____ % R = _____		<input type="checkbox"/> Rec Limits = _____	

* = Laboratory Limits

** = Olin QAPP Limits (MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
 2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. Do not evaluate if sample concentration is > 4X spike. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit but > 30%, qualify both positive results and non-detects (J). If the MS/MSD recovery is < 30% and the sample is non-detect, the results are considered unusable and flagged (R).

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data is evaluated, but no flags are applied.

6.5 Are any RPDs for MS/MSD recoveries outside of the QA/QC limits?

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where S = MS result
 D = MSD result

Yes ☐ No ☒ N/A ☐ Comments:

MS/MSD RPD Limits:

RPD \leq 20

7.0 Laboratory Duplicate

Are the RPDs for the laboratory duplicates <20% unless otherwise specified below?

Yes ☒ No ☐ N/A ☐ Comments:

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ACTION: If the RPD is greater than specified limits, qualify all results for that analyte as estimated (J).

pH* ☐ = 3%

Specific Conductivity *☒ = 5%

TSS** ☐ = 6%

TDS** ☐ = 6%

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist.

Yes ☐ No ☒ N/A ☐ Comments:

8.2 Do any rinsate blanks have positive results?

Yes ☐ No ☐ N/A ☒ Comments:

ACTION: Evaluate rinsate results vs. blank results to determine if contaminant may be laboratory-derived. If not lab-related, qualify according to the table below.

If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

NOTE: MADEP does not require the collection of rinsate blanks.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates.

Yes ☒ No ☐ N/A ☐ Comments:

9.2 Were field duplicates collected per the required frequency?

Yes ☒ No ☐ N/A ☐ Comments:

QAPP/IRSWP ☐ MADEP Option 1(1 per 20) ☐ MADEP Option 3 (1 per 10) ☐

9.3 Was the RPD $\leq 30\%$ for waters $\leq 50\%$ for soils? Calculate the RPD for results and attach to this review.

Yes ☒ No ☐ N/A ☐ Comments:

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ACTION:. Qualify data (J) for both sample results if the RPD exceeded.

Was any of the data qualified?

Yes ☐

No ☒

N/A ☐

Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES:-

MACTEC, 2007. "Draft Interim Response Steps Work Plan"; Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts.; Project No. 6300-06-0010/41.1; July 25, 2007.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," WSC-CAM #10-320, Final, Revision No. 1, 5 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

Field Duplicate

field_sample_id	qc_code	param_name	final_result	average	difference	RPD
OC-DUP-202D	FD	Chloride	180	175	10	6%
OC-GW-202D	FS	Chloride	170			
OC-DUP-202D	FD	LAB SPECIFIC CONDUCTANCE	2400	2400	0	0%
OC-GW-202D	FS	LAB SPECIFIC CONDUCTANCE	2400			
OC-DUP-202D	FD	Nitrogen, as Ammonia	120	130	20	15%
OC-GW-202D	FS	Nitrogen, as Ammonia	140			
OC-DUP-202D	FD	Sulfate	880	870	20	2%
OC-GW-202D	FS	Sulfate	860			

MJW
12/12/12

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Reviewer/Date Mike Washburn 12/12/12
 Sr. Review/Date Chris Riccardi 1/18/13
 Lab Report # 480-28687
 Project # 610720016

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for Sampling, Data Evaluation and Reporting Activities." MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? Yes ☒ No ☐ N/A ☐ Comments:
 Check items received.

☒ Name of Laboratory ☒ Address ☒ Project ID ☒ Phone # ☒ Sample identification – Field and Laboratory
 Client Information: ☒ Name ☒ Address ☒ Client Contact (IDs must be cross-referenced)

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement

Yes ☒ No ☐ N/A ☐ Comments:

Does the laboratory report include a completed Analytical Report Certification in the required format?

ACTION: If no, contact lab for submission of missing certification or certification with correct format.

1.3 Laboratory Case Narrative:

Yes ☒ No ☐ N/A ☐ Comments:

☒ Narrative serves as an exception report for the project and method QA/QC performance. ☒ Narrative includes an explanation of each discrepancy on the Certification Statement.

ACTION: If no, contact lab for submission of missing or illegible information.

1.4 Chain of Custody (COC) copy present with all documentation completed?

Yes ☒ No ☐ N/A ☐ Comments:

Does the laboratory report include copies of Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of missing completed COC.

1.5 Sample Receipt Information (Cooler Receipt Form): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

Yes ☒ No ☐ N/A ☐ Comments:

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☒ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☒ Container type noted ☒ Condition observed ☒ pH verified (where applicable) ☐ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used?

Ammonia, – 1 Liter polyethylene/H₂SO₄ to pH<2, cool to 4°C

Yes ☒ No ☐ N/A ☐ Comments:

Oil & Grease – 1 Liter glass/HCL or H₂SO₄ to pH<2, cool to 4°C

Alkalinity – 1 Liter polyethylene/cool to 4°C

Chemical Oxygen Demand – 50 mL polyethylene/H₂SO₄ to pH<2, cool to 4°C

Chloride, pH, sulfate, nitrate, nitrite - 50 mL polyethylene/cool to 4°C

Nitrate/nitrite - H₂SO₄ to pH<2, cool to 4°C

Organic Carbon – 500 mL amber glass bottle/HCl or H₂SO₄ to pH<2, cool to 4°C

Sulfide – 50 mL polyethylene/ZnAcetate + NaOH to pH>9, cool to 4°C

Phenolics - H₂SO₄ to pH<2, cool to 4°C

Specific conductance, TDS, TSS – 100 mL polyethylene/cool to 4°C

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

1.5.2 Were all samples delivered to the laboratory without breakage?

Yes ☒ No ☐ N/A ☐ Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes ☐ No ☒ N/A ☐ Comments:

1.6 Sample Results Section: Was the following information supplied in the laboratory report for each sample?

Yes ☒ No ☐ N/A ☐ Comments:

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- ☒ Field ID and Lab ID ☒ Date and time collected ☒ Analyst Initials ☒ Dilution Factor ☒ % moisture or solids ☒ Reporting limits
☒ *Clean-up method* ☒ Analysis method ☒ Preparation method ☒ Date of preparation/extraction/digestion clean-up and analysis, where applicable
☒ Matrix ☒ Target analytes and concentrations ☒ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? Yes ☒ No ☐ N/A ☐ Comments:

- ☒ Method blank results ☒ LCS recoveries ☒ MS/MSD recoveries and RPDs ☒ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Yes ☐ No ☒ N/A ☐ Comments:

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? The holding times are as follows:

28 days = ammonia, chemical oxygen demand, chloride, organic carbon, oil & grease, specific conductance, total organic carbon and sulfate

Alkalinity = 14 days

Sulfide, TDS, TSS = 7 days

pH = analyze immediately

Nitrate nitrogen as N = 48 hrs

Nitrite nitrogen as N = 48 hrs

Nitrate + Nitrite as N = 28 days

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded qualify results (J). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. Professional judgment used to qualify soils.

3.0 Laboratory Method

Yes ☒ No ☐ N/A ☐ Comments:

3.1 Was the correct laboratory method used?

ACTION: If no, contact lab to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change or to request variance.

3.2 Are the practical quantitation limits the same as those specified by the Yes ☒ No ☐ N/A ☐ Comments:
☐ QAPP/IRSWP ☐ Lab?

Note: The MADEP QA/QC Guidelines do not yet list PQLs for wet chemistry analyses,

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therefore all criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements default to limits employed by the lab**. Other criteria may also apply.*

Ammonia* <input checked="" type="checkbox"/> = 0.1 mg/ L	Alkalinity** <input type="checkbox"/> = 1 mg/L	Bicarbonate Alkalinity** <input type="checkbox"/> = 1 mg/L	Carbonate Alkalinity** <input type="checkbox"/> = 1 mg/L
Nitrate Nitrogen as N* <input type="checkbox"/> = .05 mg/L	Nitrite Nitrogen as N* <input type="checkbox"/> = .01 mg/L	Chloride* <input checked="" type="checkbox"/> = 1 mg/L	Hardness * <input type="checkbox"/> = 2 mg/L
Spec. Cond.** <input checked="" type="checkbox"/> 3 umhos/cm	Total Organic Carbon** <input type="checkbox"/> = 1 mg/L	Oil & Grease* <input type="checkbox"/> = 5.5 mg/L	Sulfate (EPA 300.0)* <input checked="" type="checkbox"/> = 2 mg/L
COD:* Low – 20 mg/L	COD* High - 50 mg/L <input type="checkbox"/>	TDS* <input type="checkbox"/> = 10 mg/L	TSS* <input type="checkbox"/> = 5 mg/L
pH* <input type="checkbox"/> < 2 to > 12	Phenolic - 0.01 mg/L		
Other parameter(list) _____	PQL = _____	<input type="checkbox"/> Source of PQL = _____	
Other parameter(list) _____	PQL = _____	<input type="checkbox"/> Source of PQL = _____	

ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate parameter results present for each sample in the SDG? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact the lab for submission.

4.0 **Method Blanks** Yes ☒ No ☐ N/A ☐ Comments:

4.1 Are the Method Blank Summaries present?

ACTION: If no, call the laboratory for submission of missing data.

4.2 Was a method blank analyzed for each analysis batch of wet chemistry field samples of 20 or less? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

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4.3 Is the method blank less than the PQL? (See Section 3.2 for PQLs).

Yes ☒

No ☐

N/A ☐

Comments:

4.4 Do any method blanks have positive results for wet chemistry parameters? Qualify data according to the following:

Yes ☐

No ☒

N/A ☐

Comments:

If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

ACTION: If any blank has positive results, list all the concentrations detected and flagging level (flagging level = $5 \times$ blank value) on the checklist. List all affected samples and their qualifiers.

5.0 Laboratory Control Standards

5.1 Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less?

Yes ☒

No ☐

N/A ☐

Comments:

ACTION: If no, call laboratory for LCS form submittal. If data is not available, use professional judgment to determine qualification actions for data associated with the batch.

5.2 Is a LCS Summary Form present?

Yes ☒

No ☐

N/A ☐

Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is any wet chemistry analyte LCS recovery outside the control limits?

Yes ☐

No ☒

N/A ☐

Comments:

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LCS Limits:

Alkalinity** <input type="checkbox"/> = 80-120%	Bicarbonate Alkalinity** <input type="checkbox"/> = 80-120%	Carbonate Alkalinity** <input type="checkbox"/> = 80-120%	Specific Conductivity * <input checked="" type="checkbox"/> = 80-120%
Total Organic Carbon** <input type="checkbox"/> = 80-120%	TDS** <input type="checkbox"/> = 80-120%	Oil & Grease* <input type="checkbox"/> = 80-120%	Ammonia Nitrogen as N* <input checked="" type="checkbox"/> = 80-120%
COD Low* <input type="checkbox"/> = 80-120%	COD High* <input type="checkbox"/> = 80-120%	Nitrate Nitrogen as N** <input type="checkbox"/> = 80-120%	Nitrite Nitrogen as N** <input type="checkbox"/> = 80-120%
Hardness* <input type="checkbox"/> = 80-120%	Chloride* <input checked="" type="checkbox"/> = 80-120%	Sulfate (EPA 300.0)* <input type="checkbox"/> = 80-120%	pH* <input type="checkbox"/> = 98-102% TSS* NA

Other parameter(list) _____ %R = _____ ☐ Rec Limits= _____

Other parameter(list) _____ %R = _____ ☐ Rec Limits = _____

(MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs analyzed? List project samples that were spiked.

ACTION: If no, contact senior chemist to see if any were specified.

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Yes ☒ No ☐ N/A ☐ Comments:

6.2 Is the MS/MSD Recovery Form present?

ACTION: If no, contact lab for resubmission of missing data.

Yes ☒ No ☐ N/A ☐ Comments:

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix?

ACTION: If any matrix spike data is missing, call lab for resubmission.

Yes ☒ No ☐ N/A ☐ Comments:

6.4 Are any wet chemistry analyte spike recoveries outside of the QC limits?

Yes ☐ No ☒ N/A ☐ Comments:

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NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$

SA = Spike added

Where: SSR = Spiked sample result
SR = Sample result

MS/MSD Recovery Limits:

Alkalinity* = NA	Bicarbonate Alkalinity* = NA	Carbonate alkalinity* = NA	Ammonia* (LACHAT) <input type="checkbox"/> = 75-125%
Chloride*(SM 4500 Cl) <input checked="" type="checkbox"/> = 75-125%	Specific Conductivity * = NA	Total Organic Carbon* = NA	TDS** = NA
Oil & Grease* = NA	COD Low* <input type="checkbox"/> = 75-125%	COD High* <input type="checkbox"/> = 75-125%	Nitrate Nitrogen as N** <input type="checkbox"/> = 75-125%
Nitrite Nitrogen as N** <input type="checkbox"/> = 75-125%	Hardness* <input type="checkbox"/> = 75-125%	Sulfate (EPA 300.0)* <input checked="" type="checkbox"/> = 75-125%	pH* = NA TSS* = NA
Other parameter(list) _____ % R = _____ <input type="checkbox"/> Rec Limits = _____			

* = Laboratory Limits

** = Olin QAPP Limits (MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. Do not evaluate if sample concentration is > 4X spike. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit but > 30%, qualify both positive results and non-detects (J). If the MS/MSD recovery is < 30% and the sample is non-detect, the results are considered unusable and flagged (R).

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data is evaluated, but no flags are applied.

6.5 Are any RPDs for MS/MSD recoveries outside of the QA/QC limits?

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where S = MS result
D = MSD result

Yes ☐ No ☐ N/A ☒ Comments:

only analyzed a
MS. No MSD was
analyzed.

MS/MSD RPD Limits:

RPD \leq 20

7.0 Laboratory Duplicate

Are the RPDs for the laboratory duplicates <20% unless otherwise specified below?

Yes ☒ No ☐ N/A ☐ Comments:

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ACTION: If the RPD is greater than specified limits, qualify all results for that analyte as estimated (J).

pH* ☐ = 3%

Specific Conductivity *☒ = 5%

TSS** ☐ = 6%

TDS** ☐ = 6%

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist.

Yes ☐

No ☒

N/A ☐

Comments:

8.2 Do any rinsate blanks have positive results?

Yes ☐

No ☐

N/A ☒

Comments:

ACTION: Evaluate rinsate results vs. blank results to determine if contaminant may be laboratory-derived. If not lab-related, qualify according to the table below.

If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

NOTE: MADEP does not require the collection of rinsate blanks.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates.

Yes ☐

No ☒

N/A ☐

Comments:

9.2 Were field duplicates collected per the required frequency?

Yes ☐

No ☐

N/A ☒

Comments:

QAPP/IRSWP ☐ MADEP Option 1(1 per 20) ☐ MADEP Option 3 (1 per 10) ☐

9.3 Was the RPD $\leq 30\%$ for waters $\leq 50\%$ for soils? Calculate the RPD for results and attach to this review.

Yes ☐

No ☐

N/A ☒

Comments:

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ACTION:. Qualify data (J) for both sample results if the RPD exceeded.

Was any of the data qualified?

Yes ☐

No ☒

N/A ☐

Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES:-

MACTEC, 2007. "Draft Interim Response Steps Work Plan"; Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts.; Project No. 6300-06-0010/41.1; July 25, 2007.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," WSC-CAM #10-320, Final, Revision No. 1, 5 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

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Reviewer/Date Mike Wasiluk 12/12/12
 Sr. Review/Date Chris Riccardi 1/18/13
 Lab Report # 480-28728
 Project # 6107120016

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? Yes ☒ No ☐ N/A ☐ Comments:
 Check items received.

☒ Name of Laboratory ☒ Address ☒ Project ID ☒ Phone # ☒ Sample identification – Field and Laboratory
 Client Information: ☒ Name ☒ Address ☒ Client Contact (IDs must be cross-referenced)

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 **Laboratory Report Certification Statement**

Yes ☒ No ☐ N/A ☐ Comments:

Does the laboratory report include a completed Analytical Report Certification in the required format?

ACTION: If no, contact lab for submission of missing certification or certification with correct format.

1.3 **Laboratory Case Narrative:**

Yes ☒ No ☐ N/A ☐ Comments:

☒ Narrative serves as an exception report for the project and method QA/QC performance. ☒ Narrative includes an explanation of each discrepancy on the Certification Statement.

ACTION: If no, contact lab for submission of missing or illegible information.

1.4 Chain of Custody (COC) copy present with all documentation completed? Yes ☒ No ☐ N/A ☐ Comments:

Does the laboratory report include copies of Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of missing completed COC.

1.5 Sample Receipt Information (Cooler Receipt Form): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory? Yes ☒ No ☐ N/A ☐ Comments:

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☒ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☒ Container type noted ☒ Condition observed ☒ pH verified (where applicable) ☒ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used?

Yes ☒ No ☐ N/A ☐ Comments:

Ammonia, – 1 Liter polyethylene/H₂SO₄ to pH<2, cool to 4°C

Oil & Grease – 1 Liter glass/HCL or H₂SO₄ to pH<2, cool to 4°C

Alkalinity – 1 Liter polyethylene/cool to 4°C

Chemical Oxygen Demand – 50 mL polyethylene/H₂SO₄ to pH<2, cool to 4°C

Chloride, pH, sulfate, nitrate, nitrite - 50 mL polyethylene/cool to 4°C

Nitrate/nitrite - H₂SO₄ to pH<2, cool to 4°C

Organic Carbon – 500 mL amber glass bottle/HCl or H₂SO₄ to pH<2, cool to 4°C

Sulfide – 50 mL polyethylene/ZnAcetate + NaOH to pH>9, cool to 4°C

Phenolics - H₂SO₄ to pH<2, cool to 4°C

Specific conductance, TDS, TSS – 100 mL polyethylene/cool to 4°C

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

1.5.2 Were all samples delivered to the laboratory without breakage?

Yes ☒ No ☐ N/A ☐ Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes ☐ No ☒ N/A ☐ Comments:

1.6 **Sample Results Section:** Was the following information supplied in the laboratory report for each sample?

Yes ☒ No ☐ N/A ☐ Comments:

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- ☒ Field ID and Lab ID ☐ Date and time collected ☒ Analyst Initials ☒ Dilution Factor ☐ % moisture or solids ☒ Reporting limits
Na ☐ *Clean-up method* ☒ Analysis method ☐ Preparation method ☒ Date of preparation/extraction/digestion clean-up and analysis, where applicable
☒ Matrix ☒ Target analytes and concentrations ☒ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? Yes ☒ No ☐ N/A ☐ Comments:

- ☒ Method blank results ☒ LCS recoveries ☐ MS/MSD recoveries and RPDs ☐ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Yes ☒ No ☐ N/A ☐ Comments:

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? The holding times are as follows:

28 days = ammonia, chemical oxygen demand, chloride, organic carbon, oil & grease, specific conductance, total organic carbon and sulfate

Alkalinity = 14 days

Sulfide, TDS, TSS = 7 days

pH = analyze immediately

Nitrate nitrogen as N = 48 hrs

Nitrite nitrogen as N = 48 hrs

Nitrate + Nitrite as N = 28 days

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded qualify results (J). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. Professional judgment used to qualify soils.

3.0 Laboratory Method

Yes ☒ No ☐ N/A ☐ Comments:

3.1 Was the correct laboratory method used?

ACTION: If no, contact lab to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change or to request variance.

3.2 Are the practical quantitation limits the same as those specified by the Yes ☐ No ☒ N/A ☐ Comments:
☒ QAPP/IRSWP ☐ Lab?

Note: The MADEP QA/QC Guidelines do not yet list PQLs for wet chemistry analyses,

*Nitrite reported at 0.05
vial 0.01*

*Nitrate/Nitrite
exceeded in all
samples by 5 days
Reject nitrite
estimated nitrate*

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therefore all criteria will default to values stipulated in the QAPP*. Where the QAPP does not define criteria, QA/QC requirements default to limits employed by the lab**. Other criteria may also apply.

Ammonia* <input type="checkbox"/> = 0.1 mg/ L	Alkalinity** <input type="checkbox"/> = 1 mg/L	Bicarbonate Alkalinity** <input type="checkbox"/> = 1 mg/L	Carbonate Alkalinity** <input type="checkbox"/> = 1 mg/L
Nitrate Nitrogen as N* <input checked="" type="checkbox"/> = .05 mg/L	Nitrite Nitrogen as N* <input checked="" type="checkbox"/> = .01 mg/L	Chloride* <input checked="" type="checkbox"/> = 1 mg/L	Hardness * <input type="checkbox"/> = 2 mg/L
Spec. Cond.** <input checked="" type="checkbox"/> 3 umhos/cm	Total Organic Carbon** <input type="checkbox"/> = 1 mg/L	Oil & Grease* <input type="checkbox"/> = 5.5 mg/L	Sulfate (EPA 300.0)* <input checked="" type="checkbox"/> = 2 mg/L
COD:* Low - 20 mg/L	COD* High - 50 mg/L <input type="checkbox"/>	TDS* <input type="checkbox"/> = 10 mg/L	TSS* <input type="checkbox"/> = 5 mg/L
pH* <input type="checkbox"/> < 2 to > 12	Phenolic - 0.01 mg/L		
Other parameter(list) _____	PQL = _____	<input type="checkbox"/> Source of PQL = _____	
Other parameter(list) _____	PQL = _____	<input type="checkbox"/> Source of PQL = _____	

ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate parameter results present for each sample in the SDG? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks Yes ☒ No ☐ N/A ☐ Comments:

4.1 Are the Method Blank Summaries present?

ACTION: If no, call the laboratory for submission of missing data.

4.2 Was a method blank analyzed for each analysis batch of wet chemistry field samples of 20 or less? Yes ☒ No ☐ N/A ☐ Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

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4.3 Is the method blank less than the PQL? (See Section 3.2 for PQLs).

Yes ☒

No ☐

N/A ☐

Comments:

4.4 Do any method blanks have positive results for wet chemistry parameters? Qualify data according to the following:

Yes ☐

No ☒

N/A ☐

Comments:

If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

ACTION: If any blank has positive results, list all the concentrations detected and flagging level (flagging level = $5 \times$ blank value) on the checklist. List all affected samples and their qualifiers.

5.0 Laboratory Control Standards

5.1 Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less?

Yes ☒

No ☐

N/A ☐

Comments:

ACTION: If no, call laboratory for LCS form submittal. If data is not available, use professional judgment to determine qualification actions for data associated with the batch.

5.2 Is a LCS Summary Form present?

Yes ☒

No ☐

N/A ☐

Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is any wet chemistry analyte LCS recovery outside the control limits?

Yes ☐

No ☒

N/A ☐

Comments:

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LCS Limits:

Alkalinity** <input type="checkbox"/> = 80-120%	Bicarbonate Alkalinity** <input type="checkbox"/> = 80-120%	Carbonate Alkalinity** <input type="checkbox"/> = 80-120%	Specific Conductivity * <input checked="" type="checkbox"/> = 80-120%
Total Organic Carbon** <input type="checkbox"/> = 80-120%	TDS** <input type="checkbox"/> = 80-120%	Oil & Grease* <input type="checkbox"/> = 80-120%	Ammonia Nitrogen as N* <input checked="" type="checkbox"/> = 80-120%
COD Low* <input type="checkbox"/> = 80-120%	COD High* <input type="checkbox"/> = 80-120%	Nitrate Nitrogen as N** <input checked="" type="checkbox"/> = 80-120%	Nitrite Nitrogen as N** <input checked="" type="checkbox"/> = 80-120%
Hardness* <input type="checkbox"/> = 80-120%	Chloride* <input checked="" type="checkbox"/> = 80-120%	Sulfate (EPA 300.0)* <input checked="" type="checkbox"/> = 80-120%	pH* <input type="checkbox"/> = 98-102% TSS* NA

Other parameter(list) _____ %R = _____ ☐ Rec Limits= _____

Other parameter(list) _____ %R = _____ ☐ Rec Limits = _____

(MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs analyzed? List project samples that were spiked.

ACTION: If no, contact senior chemist to see if any were specified.

Yes ☒ No ☐ N/A ☐ Comments:

6.2 Is the MS/MSD Recovery Form present?

ACTION: If no, contact lab for resubmission of missing data.

Yes ☒ No ☐ N/A ☐ Comments:

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix?

ACTION: If any matrix spike data is missing, call lab for resubmission.

Yes ☒ No ☐ N/A ☐ Comments:

6.4 Are any wet chemistry analyte spike recoveries outside of the QC limits?

Yes ☐ No ☒ N/A ☐ Comments:

OC-SW-15C03
OC-SW-SD17

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result
SA = Spike added SR = Sample result

Alkalinity* = NA	Bicarbonate Alkalinity* = NA	Carbonate alkalinity* = NA	Ammonia* (LACHAT) <input checked="" type="checkbox"/> = 75-125%
Chloride*(SM 4500 Cl) <input checked="" type="checkbox"/> = 75-125%	Specific Conductivity * = NA	Total Organic Carbon* = NA	TDS** = NA
Oil & Grease* = NA	COD Low* <input type="checkbox"/> = 75-125%	COD High* <input type="checkbox"/> = 75-125%	Nitrate Nitrogen as N** <input checked="" type="checkbox"/> = 75-125%
Nitrite Nitrogen as N** <input checked="" type="checkbox"/> = 75-125%	Hardness* <input type="checkbox"/> = 75-125%	Sulfate (EPA 300.0)* <input checked="" type="checkbox"/> = 75-125%	pH* = NA TSS* = NA
Other parameter(list)	% R =	<input type="checkbox"/> Rec Limits =	

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data is evaluated, but no flags are applied.

NOTE: $RPD = \frac{S - D}{(S + D)/2} \times 100\%$ Where S = MS result
D = MSD result

$$\text{RPD} \leq 20$$

Are the RPDs for the laboratory duplicates <20% unless otherwise specified below? Yes [] No [] N/A [x] Comments:

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ACTION: If the RPD is greater than specified limits, qualify all results for that analyte as estimated (J).

pH* ☐ = 3%

Specific Conductivity *☐ = 5%

TSS** ☐ = 6%

TDS** ☐ = 6%

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist.

Yes ☐ No ☒ N/A ☐ Comments:

8.2 Do any rinsate blanks have positive results?

Yes ☐ No ☐ N/A ☒ Comments:

ACTION: Evaluate rinsate results vs. blank results to determine if contaminant may be laboratory-derived. If not lab-related, qualify according to the table below.

If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

NOTE: MADEP does not require the collection of rinsate blanks.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates.

Yes ☒ No ☐ N/A ☐ Comments:

9.2 Were field duplicates collected per the required frequency?

Yes ☒ No ☐ N/A ☐ Comments:

QAPP/IRSWP ☒ MADEP Option 1 (1 per 20) ☐ MADEP Option 3 (1 per 10) ☐

9.3 Was the RPD $\leq 30\%$ for waters $\leq 50\%$ for soils? Calculate the RPD for results and attach to this review.

Yes ☒ No ☐ N/A ☐ Comments:

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ACTION:. Qualify data (J) for both sample results if the RPD exceeded.

Was any of the data qualified?

Yes ☒ No ☐ N/A ☐ Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES:-

MACTEC, 2007. "Draft Interim Response Steps Work Plan"; Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts.; Project No. 6300-06-0010/41.1; July 25, 2007.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," WSC-CAM #10-320, Final, Revision No. 1, 5 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

Field Duplicate

lab_sample_id	field_sample_id	qc_code	param_name	final_result	Average	Difference	RPD
480-28728-7	OC-SW-SD-17	FS	Chloride	170	170	0	0%
480-28728-8	OC-SW-SD-17-DUP	FD	Chloride	170			
480-28728-7	OC-SW-SD-17	FS	LAB SPECIFIC	1500	1500	0	0%
480-28728-8	OC-SW-SD-17-DUP	FD	LAB SPECIFIC	1500			
480-28728-7	OC-SW-SD-17	FS	Nitrate as N	0.6	0.605	0.01	2%
480-28728-8	OC-SW-SD-17-DUP	FD	Nitrate as N	0.61			
480-28728-7	OC-SW-SD-17	FS	Nitrogen, as Ar	61	60.5	1	2%
480-28728-8	OC-SW-SD-17-DUP	FD	Nitrogen, as Ar	60			
480-28728-7	OC-SW-SD-17	FS	Sulfate	350	350	0	0%
480-28728-8	OC-SW-SD-17-DUP	FD	Sulfate	350			

msw
12/12/12